Bi-Monthly Progress Report

Period: September 1 to October 31, 1972

A. Title of Investigation:

Evaluation and Comparison of ERTS Measurements of Major Crops and Soil Associations for Selected Sites in the Central United States (originally Evaluation and Comparison of the Utility of ERTS-A Measurements over Selected Sites in Europe, North America, and South America).

ERTS-A Proposal Number:  SR #050

B. Principal Investigator:  M. F. Baumgardner
GSFC Number UN630

C. During this reporting period 70mm negatives (MSS channels 5 and 7) representing several passes of ERTS over the test sites in the Central United States were received.

No CCT's covering test sites described in the proposal were received. However, ERTS data from other areas has provided the opportunity for the development of analysis techniques.

D. Identification and Mapping of Geologic and Soils Features: ERTS multispectral scanner data were analyzed on a digital computer to determine the possibility of delineating and mapping soils and geologic features of interest in Collin County, Texas. The procedure involved automatic clustering and classification of as many as twelve spectrally separable classes. Features of interest which were identified in the classification are surface drainage patterns which correspond closely to boundaries between soils, cultivated fields, an escarpment which distinctly separates different soil associations and geologic parent materials, and three categories of water in the Lavon Reservoir. These three classes correspond to areas of relatively deep water, relatively shallow water, and shallow water containing many dead tree stumps. In the agricultural areas two categories are easily separable spectrally:  fields of green vegetation with relatively low reflectance and fields with relatively high reflectance in the visible wavelengths. Those of low reflectance correspond to cotton, grain sorghum and alfalfa. Those of high reflectance seem to be wheat stubble and grass pastures.

Fannin County, Texas, was chosen as an area to use ADP techniques with ERTS MSS data to attempt to produce a geologic map of the county. A variety of non-supervised and ratio classifications of the area were produced. Printouts from these classifications seem to show some of the geologic structure. All the classifications seem to show the contact between the Cretaceous Ozan and Austin Formations. Several of the classifications appear to show the boundary between the Austin and the Eagle Ford Formations. Drainage patterns are very apparent on the classifications because of the dense green vegetation on the stream banks.

Identification and Mapping of Agricultural, Geographic, and Land Use Features:

Digital data from portions of frame no. E-1002-16312 were analyzed. The Milwaukee and Madison areas of this frame were analyzed with the purpose of identifying general surface features in metropolitan areas. It is tentatively suggested that at least five features can be identified: water, wooded areas, rooftops, grass (open areas), and bare soil/roads.

DeKalb County, Illinois was selected for a study of agricultural features. Multispectral analysis of this area produced maps delineating all roads (including county roads and railways), rivers and lakes, towns and villages, gravel pits, and agricultural fields. A rather high degree of accuracy was achieved in separating and mapping corn and soybeans. Since this was achieved with a limited amount of ground observation data, it was not possible to assess the statistical accuracy of crop identification.

Assessment in accuracy of identification and mapping of crop species, soil associations, and other surface features can be achieved when CCT data from the Lubbock, Texas Regional Test site is analyzed. A sizeable cooperative effort is being made in that area to obtain many ground observations over a 9,000 square mile area at the time of each ERTS pass.

E.  Classifications (using the LARSYS software) were completed of portions of frames E-1002-16312 and E-1017-16093 CCT. Classifications of frame E-1002-16312 included the areas of Collin and Fannin counties, Texas. Categories identified and mapped included: surface drainage patterns, roads, agricultural fields (row crops and non row crops), escarpments separating soil associations, three categories of water, boundaries between Cretaceous Ozan, Austin, and Eagle Ford geologic formations.

Classifications of frame E-1002-16312 included the areas of Milwaukee County, Wisconsin; Madison, Wisconsin; and DeKalb, Illinois. Categories identified and mapped were: corn, soybeans, water, wooded areas, roads, open (grass) areas, bare soil, rooftops (inner-city), towns, and villages.

These results are significant in that they indicate a potential application of ERTS-type data and automatic data processing for crop identification, urban planning, and land use inventories.

F.  Publications and Papers:

(1)  Baumgardner, M. F., Kristof, S. J., and Melhorn, W. N. Mapping of Soils and Geologic Features with Data from Satellite-Borne Multispectral Scanners. (Manuscript submitted for the 10th International Congress of Soil Science, to be held in Moscow, USSR, August 12-20, 1974.)

(2)  MacLeod, N. H., and Baumgardner, M. F. 1972. Spectral Sensing of the Earth from Space. Agronomy Abstracts, p. 193. (Paper presented at annual meetings of American Society of Agronomy, Miami Beach, Florida, Oct. 29-Nov. 3.

Several reports are being prepared for submission to the NASA Scientific and Technical Information Center.

G.  No operational changes are recommended.

H.  There are no changes in the standing order form requested.

I.  No ERTS Image Descriptor forms were completed during this period.

J.  No Data Request Forms were submitted to GSFC/NDPF during this period.